Pollution by plastics in the biosphere is an increasingly big problem

Environment, Ecology

Plastics are an oil-based material that are with no doubt a very cheap and useful material, with a huge durability. This cause problems.

The huge durability means that when it is in the nature, it won't go away. Because it is so cheap and easy to make – and very useful, it is used in a large scale worldwide. This naturally leads to pollution.

Pollution by plastics in the biosphere is an increasingly big problem, and gets more and more attention from the media worldwide. This helps the normal residents, as well as big corporations, to see the direct effects of their actions. Many news articles, especially about whales and birds who eat plastics (Bateman, 2018; Horton, 2018), are eye openers for people, and all across the globe people try to make a change in their ways of living. In Norway, the story of a Cuvier's Beaked Whale (Ziphius cavirostris) who died from eating too much plastics (Horton, 2017), caused a revolution in the way people think of plastics, as well as a huge effort to clean beaches and the coastline of plastics.

Not only whales and birds suffer from the plastic pollution in the ocean. Most organisms in the ocean will at some extent suffer from the increase of plastics, and if key species are affected, whole ecosystems can end up in a bad situation. Not only the oceans are contaminated with plastics. Freshwaters are, according to studies, as bad as oceans in the subject of plastic contamination (Dris et al., 2015).

The plastic you can observe lying on beaches or in roads only is part of the problem. Microplastics are defined by the size of the particles. There are

conflicting definitions as of what size microplastics are. Even though it may be imprecise, the definition from an article in PNAS will be used for simplicity. Here microplastics are defined as plastic particles <1cm in diameter (Cozar et al., 2014). Microplastics are a smaller subject in the plastic-debate since it is so difficult to see direct effects from microplastics. The subject of microplastics has been brought up more frequently in media, and the term is becoming more and more familiar to the average person.

Different types of microplastics include plastic pellets called resin pellets, which are released during transport and manufacturing, as well as scrubbers found in cosmetics and toothpaste, fibers from clothes (fleece or other polyester containing clothes), fishing ropes, and so on (Filella, 2015).

Microplastics have hotspots where there are high densities, like ocean gyres where there has been found big amounts of microplastics in zooplankton, and in industrial coastal areas (Moore, Lattin and Zellers, 2005; Norén and Naustvoll, 2011).

Many invertebrates are filter-feeders, or very small. The microplastics are so small that they often gets mistaken for food by the lower trophic animals. Many invertebrates are incapable of distinguishing microplastics from the particles they feed on, which may cause them to capture microplastics. Planktivores higher up in the chain, can passively capture microplastics while feeding, and this can lead to injuries, impaired ability of feeding, and clogging of the digestive tract, to mention some of them (Wright, Thompson and Galloway, 2013; Tanaka and Takada, 2016).

Different types of microplastics will have different densities and buoyancies. Different organisms will therefore encounter different microplastics in the different layers of the sea.

Microplastics can also have different colors, which leads to pelagic predators, such as the octopus to mistake the plastics for food, and digest it (Wright, Thompson and Galloway, 2013).

When it comes to the situation for suspension feeders, filter feeders and detritivores, they absorb minerals and nutrients by filtration. For example can microplastics in the sediments clog the digestive systems of detritivore annelids, since they eat their way through the sediments and absorb the important nutrients. It has been shown in the polychaeta Perinereis aibuhitensis that mortality decrease by 42% when exposed to microplastics with a density of 100 beads per mL. The experiment also showed that segment regeneration rate decreased in Perinereis aibuhitensis exposed to microplastics (Leung and Chan, 2018). With an increase in microplastics of different buoyancies in the ocean, this will be a growing problem.